Geophysical Research Abstracts, Vol. 7, 10377, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10377

Fluxes through Davis Strait: Early Results from a new MeasurementProgram

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Davis Strait is a critical site for investigating freshwater exchange between the Arctic and North Atlantic and an ideal location for monitoring temporal and spatial variability in the critical upstream boundary condition for Labrador Sea convection. Fluxes through the Strait represent the net integrated Canadian Archipelago throughflow, modified by terrestrial inputs and oceanic processes during its southward transit through Baffin Bay. By the time they reach Davis Strait, Arctic waters already embody most of the transformations they undergo prior to exerting their influence on the deepwater formation sites in the Labrador Sea.

Four hydrographic sections occupied as part of the September/October 2004 Davis Strait mooring deployment cruise characterized watermass variability and currents from the southern end of Baffin Bay to the northern edge of the Labrador Sea. A southward-flowing, surface-intensified layer of Arctic water (S $\sim$ 31) stretches from the Baffin coast to the Greenland shelfbreak. The West Greenland current carries fresh Arctic waters northward in a 50 m thick layer over the Greenland shelf. Deeper (200-600 m), a core of high salinity Irminger water moves northward along the Greenland shelfbreak. Waters within the West Greenland current (> 4 °C) and bottom waters over the Greenland shelf and slope (1-2 °C) exhibited temperatures well above climatological values. The two northern sections reveal a 200 m thick core of Irminger water (5.35 °C, 34.5) centered on the 27.5 kg/m^3 isopynal over the Baffin slope. This narrow flow could be a transient branch of the north-flowing Irminger waters, an isolated eddy or a southward return after branching along the Greenland slope. Geostrophic velocity estimates (derived from potential density sections and velocities measurements collected with a 75 Hz shipboard Acoustic Doppler Current Profiler) and hydrographic properties are used to estimate volume, freshwater and heat fluxes across the four sections.

Taken together, the four sections divide the strait into three distinct volumes which can be used to evaluate budgets and constrain flux calculations. These hydrographic results represent the first stage of a three-year observational program that includes year-round measurements of water properties and ice draft/motion (moored array and autonomous underwater gliders) and annual hydrographic sampling (standard water mass properties, oxygen isotopes, nutrients, trace metals, CFCs).